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# Experimental Modeling of Spray and Water Sheet Formation Due to Wave Interactions with Vertical and Slant Bow-Shaped Model

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**Abstract :** The process of spray-cloud formation and flow kinematics produced from breaking wave impact on vertical and slant lab-scale bow-shaped models were experimentally investigated. Bubble Image Velocimetry (BIV) and Image Processing (IP) techniques were applied to study the various types of wave-model impacts. Different wave characteristics were generated in a tow tank to investigate the effects of wave characteristics, such as wave phase velocity, wave steepness on droplet velocities, and behavior of the process of spray cloud formation. The phase ensemble-averaged vertical velocity and turbulent intensity were computed. A high-speed camera and diffused LED backlights were utilized to capture images for further post processing. Various pressure sensors and capacitive wave probes were used to measure the wave impact pressure and the free surface profile at different locations of the model and wave-tank, respectively. Droplet sizes and velocities were measured using BIV and IP techniques to trace bubbles and droplets in order to measure their velocities and sizes by correlating the texture in these images. The impact pressure and droplet size distributions were compared to several previously experimental models, and satisfactory agreements were achieved. The distribution of droplets in front of both models are demonstrated. Due to the highly transient process of spray formation, the drag coefficient for several stages of this transient displacement for various droplet size ranges and different Reynolds number were calculated based on the ensemble average method. From the experimental results, the slant model produces less spray in comparison with the vertical model, and the droplet velocities generated from the wave impact with the slant model have a lower velocity as compared with the vertical model.

**Keywords :** spray charachteristics, droplet size and velocity, wave-body interactions, bubble image velocimetry, image processing
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